WHAT IS CLAIMED IS:

1. A method of making a GaN single crystal substrate comprising:

a mask layer forming step of forming on a GaAs substrate a mask layer having a plurality of opening windows disposed separate from each other; and

an epitaxial layer growing step of growing on said mask layer an epitaxial layer made of GaN.

2. A method of making a GaN single crystal substrate according to claim 1, further comprising before said mask layer forming step:

a buffer layer forming step of forming a buffer layer on said GaAs substrate; and

a lower epitaxial layer growing step of growing on said buffer layer a lower epitaxial layer made of GaN.

3. A method of making a GaN single crystal substrate according to claim 1, further comprising, before said epitaxial layer forming step, a buffer layer forming step of forming a buffer layer on said GaAs substrate in said opening windows of said mask layer.

4. A method of making a GaN single crystal substrate according to claim 2, wherein said opening windows of said mask layer are stripe windows shaped like stripes.

5. A method of making a GaN single crystal substrate according to claim 4, wherein said stripe windows extend in a <10-10> direction of said lower epitaxial layer made

of GaN and have a window width within a range of 0.3 μm to 10 μm and a mask width within a range of 2 μm to 20 μm.

6. A method of making a GaN single crystal substrate according to claim 4, wherein said stripe windows extend in a <1-210> direction of said lower epitaxial layer made of GaN and have a window width within a range of 0.3 μm to 10 μm and a mask width within a range of 2 μm to 20 μm.

7. A method of making a GaN single crystal substrate according to claim 2, further comprising after said epitaxial layer growing step:

a GaAs substrate eliminating step of eliminating said GaAs substrate; and

a grinding step of grinding a lower surface of said buffer layer and an upper surface of said epitaxial layer.

8. A method of making a GaN single crystal substrate according to claim 3, wherein said opening windows of said mask layer are stripe windows shaped like stripes.

9. A method of making a GaN single crystal substrate according to claim 8, wherein said stripe windows extend in a <11-2> direction of said GaAs substrate and have a window width within a range of 0.3 μm to 10 μm and a mask width within a range of 2 μm to 20 μm.

10. A method of making a GaN single crystal substrate according to claim 8, wherein said stripe windows extend in a <1-10> direction of said GaAs substrate and have a window width within a range of 0.3 μm to 10 μm and a mask width

within a range of 2 μm to 20 μm.

11. A method of making a GaN single crystal substrate according to claim 3, further comprising after said epitaxial layer growing step:

a GaAs substrate eliminating step of eliminating said GaAs substrate; and

a grinding step of grinding lower surfaces of said mask layer and buffer layer and an upper surface of said epitaxial layer.

12. A method of making a GaN single crystal substrate according to claim 1, wherein said GaAs substrate is a GaAs(111)A substrate or a GaAs(111)B substrate.

13. A method of making a GaN single crystal substrate according to claim 2, wherein said buffer layer is formed by hydride VPE.

14. A method of making a GaN single crystal substrate according to claim 1 , wherein said epitaxial layer is formed by hydride VPE.

15. A method of making a GaN single crystal substrate according to claim 1, wherein said epitaxial layer is grown within a thickness range of 5 μm to 300 μm;

said method further comprising, after said epitaxial layer growing step:

a GaAs substrate eliminating step of eliminating said GaAs substrate; and

a step of growing on said epitaxial layer a second

epitaxial layer made of GaN as a laminate.

16. A method of making a GaN single crystal substrate according to claim 2, wherein a plurality of said opening windows of said mask layer are arranged with a pitch L in a <10-10> direction of said lower epitaxial layer so as to form a <10-10> window group, a plurality of <10-10> window groups being arranged in parallel with a pitch d ($0.75L \leqq d \leqq 1.3L$) in a <1-210> direction of said lower epitaxial layer.

17. A method of making a GaN single crystal substrate according to claim 16, wherein said <10-10> window groups are arranged in parallel such that the center position of each opening window in each <10-10> window group shifts by about 1/2L in said <10-10> direction from the center position of each opening window in said <10-10> window group adjacent thereto.

18. A method of making a GaN single crystal substrate according to claim 3, wherein a plurality of said opening windows of said mask layer are arranged with a pitch L in a <11-2> direction on a (111) plane of said GaAs substrate so as to form a <11-2> window group, a plurality of <11-2> window groups being arranged in parallel with a pitch d ($0.75L \leqq d \leqq 1.3L$) in a <-110> direction of the (111) plane of said GaAs substrate.

19. A method of making a GaN single crystal substrate according to claim 18, wherein said <11-2> window groups

are arranged in parallel such that the center position of each opening window in each <11-2> window group shifts by about 1/2L in the <11-2> direction from the center position of each opening window in said <11-2> window group adjacent thereto.

20. A method of making a GaN single crystal substrate according to claim 16, wherein said pitch L of opening windows is within a range of 3 μm to 10 μm.

21. A method of making a GaN single crystal substrate according to claim 1, wherein said opening windows of said mask layer have any form of circle, ellipse, and polygon.

22. A method of making a GaN single crystal substrate according to claim 1, wherein each of said opening windows of said mask layer has an area of 0.7 μm^2 to 50 μm^2.

23. A method of making a GaN single crystal substrate according to claim 1, wherein each of said opening windows of said mask layer has a square form with a side of 1 μm to 5 μm or a circular form with a diameter of 1 μm to 5 μm.

24. A method of making a GaN single crystal substrate according to claim 1., wherein said opening windows have a total area which is 10% to 50% of the whole area consisting of all said opening windows and a mask portion not formed with said opening windows.

25. A method of making a GaN single crystal substrate according to claim 2, wherein said opening windows of said

mask layer are rectangular windows in an oblong form having a longitudinal direction aligning with a <10-10> direction of said lower epitaxial layer, a plurality of said rectangular windows being arranged with a pitch L in said <10-10> direction so as to form a <10-10> rectangular window group, a plurality of <10-10> rectangular window groups being arranged in parallel with a pitch d in a <1-210> direction of said lower epitaxial layer.

26. A method of making a GaN single crystal substrate according to claim 25, wherein said <10-10> rectangular window groups are arranged in parallel such that the center position of each opening rectangular window in each <10-10> rectangular window group shifts by about 1/2L in said <10-10> direction from the center position of each rectangular window in said <10-10> rectangular window group adjacent thereto.

27. A method of making a GaN single crystal substrate according to claim 3, wherein said opening windows of said mask layer are rectangular windows in an oblong form having a longitudinal direction aligning with a <11-2> direction of said GaAs substrate, a plurality of said rectangular windows being arranged with a pitch L in said <11-2> direction on a (111) plane of said GaAs substrate so as to form a <11-2> rectangular window group, a plurality of <11-2> rectangular window groups being arranged in parallel with a pitch d in a <-110> direction.

28. A method of making a GaN single crystal substrate

according to claim 27, wherein said <11-2> rectangular window groups are arranged in parallel such that the center position of each opening rectangular window in each <11-2> rectangular window group shifts by about 1/2L in said <11-2> direction from the center position of each rectangular window in said <11-2> rectangular window group adjacent thereto.

29. A method of making a GaN single crystal substrate according to claim 25, wherein said rectangular windows have a pitch L of 4 μm to 20 μm, said rectangular windows adjacent to each other in the longitudinal direction of said rectangular windows have a mask length of 1 μm to 4 μm therebetween, each of said rectangular windows has a width w of 1 μm to 5 μm, and said rectangular windows adjacent to each other in the transverse direction of said rectangular windows have a mask width (d-w) of 2 μm to 10 μm therebetween.

30. A method of making a GaN single crystal substrate according to claim 2, wherein each of said opening windows of said mask layer is a hexagonal window formed like a hexagonal ring, each of the six sides of said hexagonal window aligning with a <10-10> direction of said lower epitaxial layer.

31. A method of making a GaN single crystal substrate according to claim 3, wherein each of said opening windows of said mask layer is a hexagonal window formed like a hexagonal ring, each of the six sides of said hexagonal window aligning with a <11-2> direction of said GaAs substrate.

32. A method of making a GaN single crystal substrate

according to claim 1, wherein said mask layer is formed from one of SiO_2 and SiN.

33. A method of making a GaN single crystal substrate according to claim 1, further comprising a step of eliminating said GaAs substrate.

34. A method of making a GaN single crystal substrate according to claim 1, wherein said epitaxial layer is grown in said epitaxial layer growing step so as to form an ingot of GaN single crystal,

said method further comprising a cutting step of cutting said ingot into a plurality of sheets.

35. A method of making a GaN single crystal substrate according to claim 1, wherein said epitaxial layer is grown in said epitaxial layer growing step so as to form an ingot of GaN single crystal,

said method further comprising a cleaving step of cleaving said ingot into a plurality of sheets.

36. A method of making a GaN single crystal substrate comprising:

an ingot forming step of growing on the GaN single crystal substrate obtained by the method according to claim 1 an epitaxial layer made of GaN so as to form an ingot of GaN single crystal; and

a cutting step of cutting said ingot into a plurality of sheets.

37. A method of making a GaN single crystal substrate

comprising:

an ingot forming step of growing on the GaN single crystal substrate obtained by the method according to claim 1 an epitaxial layer made of GaN so as to form an ingot of GaN single crystal; and

a cleaving step of cleaving said ingot into a plurality of sheets.

38. A method of making a GaN single crystal substrate comprising:

an ingot forming step of forming an ingot of GaN single crystal by growing an epitaxial layer made of GaN on a GaN single crystal employed as a seed crystal; and

a cutting step of cutting said ingot into a plurality of sheets.

39. A method of making a GaN single crystal substrate comprising:

an ingot forming step of forming an ingot of GaN single crystal by growing an epitaxial layer made of GaN on a GaN single crystal employed as a seed crystal; and

a cleaving step of cleaving said ingot into a plurality of sheets.

40. A GaN single crystal substrate including, at least, a mask layer having a plurality of opening windows disposed separate from each other; and an epitaxial layer made of GaN and laminated on said mask layer.

41. A GaN single crystal substrate according to claim

40, further comprising, on a side of said mask layer not formed with said epitaxial layer, a buffer layer and a lower epitaxial layer formed between said buffer layer and said mask layer.

42. A GaN single crystal substrate according to claim 40, wherein a buffer layer is formed within each of said opening windows of said mask layer.

43. A GaN single crystal substrate according to claim 41, wherein said opening windows of said mask layer are arranged with a pitch L in a <10-10> direction of said lower epitaxial layer so as to form a <10-10> window group, a plurality of <10-10> window groups being arranged in parallel with a pitch d ($0.75L \leqq d \leqq 1.3L$) in a <1-210> direction of said lower epitaxial layer.

44. A GaN single crystal substrate according to claim 43, wherein said <10-10> window groups are arranged in parallel such that the center position of each opening window in each <10-10> window group shifts by about 1/2L in said <10-10> direction from the center position of each opening window in said <10-10> window group adjacent thereto.

45. A GaN single crystal substrate according to claim 40, wherein a low dislocation density region having a dislocation density lower than that in an area above said opening windows is formed above a mask portion not formed with said opening windows in said mask layer within a range of 10 μm or less from a contact surface of said epitaxial

layer with said mask layer.

46. A GaN single crystal substrate according to claim 45, wherein the dislocation density in said low dislocation density region of said epitaxial layer is 1×10^8 cm^{-2} or less.

47. A GaN single crystal substrate according to claim 40, further comprising a GaAs substrate on a side of said mask layer opposite from the side formed with said epitaxial layer.

48. A GaN single crystal substrate according to claim 40, wherein said epitaxial layer has a thickness within a range of 5 μm to 300 μm, a second epitaxial layer made of GaN being further formed on said epitaxial layer.

49. A GaN single crystal substrate according to claim 40, made by the method of making a GaN single crystal substrate according to one of claims 1.

50. A GaN single crystal substrate according to claim 40, made by the method of making a GaN single crystal substrate according to one of claims 34.

51. A GaN single crystal substrate according to claim 50, wherein said GaN single crystal substrate has an n-type carrier concentration within a range of 1×10^{16} cm^{-3} to 1×10^{20} cm^{-3}.

52. A GaN single crystal substrate according to claim 50, wherein said GaN single crystal substrate has an electron mobility within a range of 60 cm^2 to 800 cm^2.

53. A GaN single crystal substrate according to claim 50, wherein said GaN single crystal substrate has a resistivity within a range of 1×10^{-4} Ωcm to 1×10 Ωcm.

54. A light-emitting device comprising:

the GaN single crystal substrate according to claim 40; and

a semiconductor layer formed on said GaN single crystal substrate,

said semiconductor layer constituting a light-emitting element.

55. An electronic device comprising:

the GaN single crystal substrate according to claim 40; and

a semiconductor layer formed on said GaN single crystal substrate,

said semiconductor layer constituting at least a pn junction.

56. A method of making a GaN single crystal substrate according to claim 3, wherein said buffer layer is formed by hydride VPE.

57. A method of making a GaN single crystal substrate according to claim 3, wherein said epitaxial layer is grown within a thickness range of 5 μm to 300 μm;

said method further comprising, after said epitaxial layer growing step:

a GaAs substrate eliminating step of eliminating said

GaAs substrate; and

a step of growing on said epitaxial layer a second epitaxial layer made of GaN as a laminate.

58. A GaN single crystal substrate according to claim 42, wherein said epitaxial layer has a thickness within a range of 5 μm to 300 μm, a second epitaxial layer made of GaN being further formed on said epitaxial layer.